Summary of VOC/HAP Emissions for Pollution Control Industries, Inc. (089-00345)

In draft TV permit (as of 4/11/05)

Unit	Uncontrolled VOC/HAP PTE (tpy)	Controlled VOC/HAP PTE (tpy)
HWF Storage (Unit 1)	8.87	0.089
HWF Shipping (Unit 2)	#REF!	#REF!
Tower (Unit 3)	N/A	N/A
Lab Pack - Organic Liquids (Unit 4)	2.48	0.050
Lab Pack - Acids and Caustics (Unit 4)	insig.	insig.
Lab Pack - Dry Chemicals (Unit 4)	N/A	N/A
Aerosol Can Unit (Unit 5)	N/A	N/A
Metal Wash (Unit 6)	N/A	N/A
Small Hazardous Shredder (Unit 7)	#REF!	#REF!
	#REF!	**#REF!**

Equipment added through MSM 089-15970-00345

Unit	Uncontrolled VOC/HAP PTE (tpy)	Limited VOC/HAP PTE (tpy)
SDS Shredder (stack SDS 01)	0.12	0.122
ATDS (stack SDS 02)	0.74	0.74
Distillation Unit (SDS 05)	0.06	0.061
Storage Tanks	2.81	2.81
	3.73	**3.73**

Source; Notes
TANKS 4.0
AP-42 methodology; unknown chemical surrogate
Destroyed by fire
PCI
PCI
PCI
Removed
Removed
PCI; questionable - based on stack test results from destroyed tower

Source
limit to avoid 326 IAC 2-3 per MPM 18513
limit to avoid 326 IAC 2-3 per MPM 18514
limit to avoid 326 IAC 2-3 per MPM 18515
per TSD of MSM 15970

Cell: D21
Comment: not limited; = uncontrolled

Appendix A: Emissions Calculations
Emissions Summary Sheet

Company Name: Tradebe Treatment and Recycling LLC
Source Address: 4343 Kennedy Avenue, East Chicago, IN 46312
Permit Number: T089-35879-00345
Reviewer: Dominic Williams

Project (Original Permit)	Uncontrolled PTE (TPY)											
	Emission Unit	PM	PM_{10}	$PM_{2.5}$	SO_2	NOx	VOC	CO	CO2e	Total HAPs	Highest Single HAP	
City of East Chicago, Indiana, Department of Air Quality Operation Permits (OP) 1 through 12 and Title V 089-7738-00345	HWM Storage	0	0	0	0	0	8.9	0	0	8.9	8.9	Toluene
	Tank 24HP	0	0	0	0	0	2.2	0	0	2.2	2.2	Toluene
	Area 2 Shipping and Receiving	0	0	0	0	0	59.3	0	0	59.3	59.3	Toluene
	Area 8/10 Shipping and Receiving	0	0	0	0	0	77.3	0	0	77.3	77.3	Toluene
	Unit 4 (Lab Pack Booths)	3.1	3.1	3.1	0	0	2.5	0	0	2.5	2.5	Toluene
2003 Modification (MSM 089-15970-00345)	SDS Shredder	0	0	0	0	0	2.6	0	0	2.6	2.6	Toluene
	SDS Shaker and conveyor	77.7	77.7	77.7	0	0	0.0	0	0	0	0	
	SDS-ATDU from NG	0.1	0.5	0.5	0.04	6.8	0.4	5.7	8,248	0.13	0.12	Toluene
	SDS-VRU	0	0	0	0	0	2,328	809.2	14,706	904.3	904.3	Hexane
	Flare FL1 (from VRU)	0	0	0	8.1	5.2	10.8	28.5	1,505	13.4	12.6	HCl
	Distillation	0	0	0	0	0	2.3	0	0	2.3	2.3	Toluene
	Tanks 52-55	0	0	0	0	0	0.5	0	0	0.5	0.5	Toluene
	Heater	0.02	0.1	0.1	0.01	1.1	0.1	0.9	1,322	0.02	0.02	Toluene
2007-2008 (MSM 089-26876-00345 and AA 089-24703-00345)	Tanks 57-67	0	0	0	0	0	1.9	0	0	1.9	1.9	Toluene
	Thin Film Evap	0.02	0.1	0.1	0.01	1.1	0.1	0.9	1,269	0.02	0.02	Toluene
2014 Modification (MSM 089-34241-00345)	Degassing	0	0	0	0	0	17.0	0	0	0.3	0.3	Toluene
2015 Modification (SSM 089-34432-00345)	SDS Shredder II	0	0	0	0	0	7.1	0	0	7.1	7.08	Tetrachloroethylene
	SDS-ATDU II from NG	0.3	1.0	1.0	0.1	13.7	0.8	11.5	16,587	0.3	0.25	Hexane
	SDS VRU II	0	0	0	0	0	4,656	1,618	29,411	1,809	1,809	Hexane
	Flare FL1 *(from VRU II)*	0	0	0	16.2	10.5	21.6	57.0	3,010	14.0	13.1	HCl
	Solids Handling (SHS)	330.4	330.4	330.4	0	0	0.7	0	0	0	0	Toluene
	Tank 81-87	0	0	0	0	0	1.3	0	0	1.3	1.3	Toluene
	F-01 & F-02	0	0	0	0	0	0.1	0	0	0.1	0.1	Toluene
	Cooling Tower	0.7	0.2	0.0	0	0	0	0	0	0	0	
	Pot Still (modified in 2015)*	0	0	0	0	0	4.2	0	0	4.17	4.17	Toluene
	Emergency Generator (G1)	0.2	0.1	0.1	0.9	5.4	0.2	1.2	261	2.5E-03	1.2E-03	Benzene
Title V 089-35879-00324	Emergency Generator (G3)	4.3E-06	5.6E-04	5.6E-04	3.3E-05	0.2	6.6E-03	0.02	7.95	4.0E-03	3.0E-03	Formaldehyde
	Tank 88	0	0	0	0	0	0	0	0	0	0	
Title V 089-7738-00345	Fugitive	1.9	0.4	0.4	0	0	0	0	0	0	0	
	Source Total	**414.3**	**413.5**	**413.3**	**25.3**	**44.0**	**7,206**	**2,533.3**	**76,328**	**2,911.3**	**904.3**	**Hexane**

*The existing pot still was modified in 2015 and therefore is included as part of the 2015 modification.

2003 Modification Total	**77.9**	**78.3**	**78.3**	**8.1**	**13.2**	**2,345**	**844.3**	**25,781**	**923.3**	**904.3**	**Hexane**
2015 Modification Total	**331.5**	**331.7**	**331.5**	**17.2**	**29.6**	**4,692**	**1,688**	**49,270**	**1,836**	**1,809**	**Hexane**

Project	Limited PTE (TPY)											
	Emission Unit	PM	PM_{10}	$PM_{2.5}$	SO_2	NOx	VOC	CO	CO2e	Total HAPs	Highest Single HAP	
City of East Chicago, Indiana, Department of Air Quality Operation Permits (OP) 1 through 12 and Title V 089-7738-00345	HWM Storage	0	0	0	0	0	8.9	0	0	8.9	8.9	Toluene
	Tank 24HP	0	0	0	0	0	2.2	0	0	2.2	2.2	Toluene
	Area 2 Shipping and Receiving	0	0	0	0	0	21.3	0	0	21.3	21.3	Toluene
	Area 8/10 Shipping and Receiving	0	0	0	0	0	21.3	0	0	21.3	21.3	Toluene
	Unit 4 (Lab Pack Booths)	3.1	3.1	3.1	0	0	2.5	0	0	2.5	2.5	Toluene
2003 Modification (MSM 089-15970-00345)	SDS Shredder	0	0	0	0	0	0.1	0	0	2.6	2.6	Toluene
	SDS Shaker and conveyor	77.7	77.7	77.7	0	0	0.7	0	0	0	0	
	SDS-ATDU from NG	0.1	0.5	0.5	0.04	6.8		5.7	8,248	0.13	0.12	Hexane
	SDS-VRU	0	0	0	0	0	Less Than	8.6	14,706	904.3	904.3	Hexane
	Flare FL1 (from VRU)	0	0	0	8.1	5.2	23.4	28.5	1,505	13.4	12.6	Toluene
	Distillation	0	0	0	0	0	0.06	0	0	2.3	2.3	Toluene
	Tanks 52-55	0	0	0	0	0	0.5	0	0	0.5	0.5	Toluene
	Heater	0.02	0.1	0.1	0.01	1.1	0.1	0.9	1,322	0.02	0.02	Toluene
2007-2008 (MSM 089-26876-00345 and AA 089-24703-00345)	Tanks 57-67	0	0	0	0	0	1.9	0	0	1.9	1.9	Toluene
	Thin Film Evap	0.02	0.1	0.1	0.01	1.1	0.1	0.9	1,269	0.02	0.02	Toluene
2014 Modification (MSM 089-34241-00345)	Degassing	0	0	0	0	0	17.0	0	0	0.28	0.28	Toluene
2015 Modification (SSM 089-34432-00345)	SDS Shredder II	0	0	0	0	0		0	0	7.1	7.1	Toluene
	SDS-ATDU II from NG	0.3	1.0	1.0	0.1	13.7		11.5	16,587	0.3	0.2	Hexane
	SDS VRU II	0	0	0	0	0	*Less	17.6	29,411	1,809	1,809	Hexane
	Flare FL1 *(from VRU II)*	0	0	0	16.2	10.5	Than	57.0	3,010	14.0	13.1	HCl
	Solids Handling (SHS)	82.8	82.8	82.8	0	0	95.6	0	0	0	0	Toluene
	Tanks 81-87	0	0	0	0	0		0	0	1.3	1.3	Toluene
	F-01 & F-02	0	0	0	0	0		0	0	0.1	0.1	Toluene
	Cooling Tower	0.7	0	0	0	0	0	0	0	0	0	
	Pot Still (modified in 2015)*	0	0	0	0	0	4.2	0	0	4.17	4.17	Toluene
	Emergency Generator (G1)	0.2	0.1	0.1	0.9	5.4	0.2	1.2	261	2.5E-03	1.2E-03	Benzene
Title V 089-35879-00324	Emergency Generator (G3)	4.3E-06	5.6E-04	5.6E-04	3.3E-05	0.2	6.6E-03	0.02	7.95	4.0E-03	3.0E-03	Formaldehyde
	Tank 88	0	0	0	0	0	0.0	0	0	0	0	
Title V 089-7738-00345	Fugitive	1.9	0.4	0.4	0	0	0	0	0	0	0	
	Source Total	**166.7**	**165.9**	**165.8**	**25.3**	**44.0**	**Less Than 199.9**	**132.0**	**76,328**	**2,817**	**2,713**	**Hexane**

*The existing pot still was modified in 2015 and therefore is included as part of the 2015 modification.

2003 Modification	**2003 Modification Total**	**77.9**	**78.3**	**78.3**	**8.1**	**13.2**	**Less Than 24.9**	**43.8**	**25,781**	**923.3**	**904.4**	**Hexane**
2015 Modification	**2015 Modification Total**	**83.9**	**84.1**	**83.9**	**17.2**	**29.6**	**Less Than 99.9**	**87.4**	**49,270**	**1,836**	**1,809**	**Hexane**

Appendix A: Emission Calculations
SDS Shredder II

Company Name: Tradebe Treatment and Recycling LLC
Source Address: 4343 Kennedy Avenue, East Chicago, IN 46312
Permit Number: T089-35879-00345
Reviewer: Dominic Williams

The SDS Shredder II is similar to the existing SDS Shredder. Therefore,
VOC concentration is assumed to be equal to VOC concentration tested from the shredder exhaust for SDS.
SDS Shredder stack test (6/4/09) resulted in VOC emission rate of:

11.4	ppmv as propane (C3H8)
0.0002	lb/hr as C2Cl4

SDS II design air flow rate from the shredder exhaust will be:

70	scfm

Controlled VOC/HAPs potential to emit

0.032	lb/hr as C2Cl4
0.14	tons/yr

Uncontrolled VOC/HAPs PTE (assuming a carbon control efficiency of 98%) =

1.62	lb/hr as C2Cl4
7.08	tons/yr

Methodology

Controlled PTE = flow rate (scfm) * 60 min/hr * emission rate (ppmv) /1000000 cf exhaust * (0.1196 lb propane/cf propane) * (497.49 lb C2Cl4/88.18 lb C3H8) =
Uncontrolled PTE (ton/yr) = Controlled PTE (ton/yr) / (1 - Control Efficiency (%))

Appendix A: Emission Calculations
ATDU Burner

Company Name: Tradebe Treatment and Recycling LLC
Source Address: 4343 Kennedy Avenue, East Chicago, IN 46312
Permit Number: T089-35879-00345
Reviewer: Dominic Williams

Heat Input Capacity MMBtu/hr	mmBtu / mmscf	Potential Throughput MMCF/yr
32.0	1020	274.8

	Pollutant						
	PM*	PM10*	direct PM2.5*	SO2	NOx	VOC	CO
Emission Factor in lb/MMCF	1.9	7.6	7.6	0.6	100 **see below	5.5	84
Potential Emission in	0.26	1.04	1.04	0.08	13.7	0.76	11.5

*PM emission factor is filterable PM only. PM10 emission factor is filterable and condensable PM10 combined.
PM2.5 emission factor is filterable and condensable PM2.5 combined.
**Emission Factors for NOx: Uncontrolled = 100, Low NOx Burner = 50, Low NOx Burners/Flue gas recirculation = 32

Methodology
All emission factors are based on normal fir
MMBtu = 1,000,000 I
MMCF = 1,000,000 Cubic Fe
Emission Factors are from AP 42, Chapter 1.4, Tables 1.4-1, 1.4-2, 1.4-3, SCC #1-02-006-02, 1-01-006-02, 1-03-006-02, and 1-03-006-03
Potential Throughput (MMCF/yr) = Heat Input Capacity (MMBtu/hr) x 8,760 hrs/yr x 1 MMCF/1,020 MMBtu
Emission (tons/yr) = Throughput (MMCF/yr) x Emission Factor (lb/MMCF)/2,000 lb/ton

	HAPs - Organics					
	Benzene	Dichlorobenzene	Formaldehyde	Hexane	Toluene	**Total - Organics**
Emission Factor in lb	2.1E-03	1.2E-03	7.5E-02	1.8E+00	3.4E-03	
Potential Emission in	2.9E-04	1.6E-04	1.0E-02	0.25	4.7E-04	**0.26**

	HAPs - Metals					
	Lead	Cadmium	Chromium	Manganese	Nickel	**Total - Metals**
Emission Factor in lb	5.0E-04	1.1E-03	1.4E-03	3.8E-04	2.1E-03	
Potential Emission in	6.9E-05	1.5E-04	1.9E-04	5.2E-05	2.9E-04	**7.5E-04**
					Total HAPs	**0.26**
					Worst HAP	**0.25**

Methodology is the same as above.
The five highest organic and metal HAPs emission factors are provided above.
Additional HAPs emission factors are available in AP-42, Chapter 1.4.

	Greenhouse Gas		
	CO2	CH4	N2O
Emission Factor in lb	120,000	2.3	2.2
Potential Emission in	16,489	3.16E-01	3.02E-01
Summed Potential Emissions in tons/yr		16,490	
CO2e Total in tons/yr		16,587	

Methodology
The N2O Emission Factor for uncontrolled is 2.2. The N2O Emission Factor for low Nox burner is 0.64.
Emission Factors are from AP 42, Table 1.4-2 SCC #1-02-006-02, 1-01-006-02, 1-03-006-02, and 1-03-006-03.
Global Warming Potentials (GWP) from Table A-1 of 40 CFR Part 98 Subpart A.
Emission (tons/yr) = Throughput (MMCF/yr) x Emission Factor (lb/MMCF)/2,000 lb/ton
CO2e (tons/yr) = CO2 Potential Emission ton/yr x CO2 GWP (1) + CH4 Potential Emission ton/yr x CH4 GWP (25) + N2O Potential

Appendix A: Emission Calculations
Solids Handling System

Company Name: Tradebe Treatment and Recycling LLC
Source Address: 4343 Kennedy Avenue, East Chicago, IN 46312
Permit Number: T089-35879-00345
Reviewer: Dominic Williams

Total VOC* (ug/m3)	VOC/HAPs PTE (lb/hr)	VOC/HAPs PTE (ton/yr)
9365	0.154	0.7

*Based on results of similar unit (SDS 04)

Unit	Maximum Air Flow (acfm)	Design Outlet Grain Loading (gr/scf)	Overall Control Efficiency	PTE of PM/PM10/PM2.5 After Control (lbs/hr)	PTE of PM/PM10/PM2.5 After Control (ton/yr)	PTE of PM/PM10/PM2.5 Before Control (lbs/hr)	PTE of PM/PM10/PM2.5 Before Control (ton/yr)	Limited PM/PM10/PM2.5 Emissions (lb/hr)	Limited PM/PM10/PM2.5 Emissions (ton/yr)	Equivalent Limited Control Efficiency
SDS 04	4400	0.04	98%	1.51	6.6	75.43	330.4	18.90	82.8	74.9%

Assume PM=PM10=PM2.5

Methodology

VOC/HAPs PTE (ton/yr) = VOC (ug/m3) x 1 g / 1000000 ug x 0.0283 m^3 / ft^3 x 1 lb / 453.6 g x air flow (acfm) x 60 min/1 hour x 1 ton/2000 lb x 8760 hrs/yr
PTE of PM/PM10/PM2.5 After Control (ton/yr) = air flow (acfm) x grain loading (gr/scf) x 1 lb / 7000 gr x 60 min/1 hour x 1 ton/2000 lb x 8760 hrs/yr
PTE of PM/PM10/PM2.5 Before Control = PTE of PM/PM10/PM2.5 After Control x (1 - control efficiency)
Equivalent Limited Control Efficiency = 1 - [Limited PM/PM10/PM2.5 Emissions (lb/hr) / PTE of PM/PM10/PM2.5 Before Control (lbs/hr)]

Appendix A: Emission Calculations
Vapor Recovery Unit - VRU II

Company Name: Tradebe Treatment and Recycling LLC
Source Address: 4343 Kennedy Avenue, East Chicago, IN 46312
Permit Number: T089-35979-00345
Reviewer: Dominic Williams

Emission factors for SDS II VRU based on testing performed on existing SDS VRU, designed in the Tradebe Title V permit as SDS 07

Air Flow Rate to Flare for SDS 07

Max Air Flow 394.92 scfm (saturated) 5% percent moisture
Dry air flow 365.674

Operating Level During Test for SDS 07

Average process rate during sampling = 2.19 tons per hour

Constituent	Sample 1	Sample 2	Sample 3	Sample 4	Average	CFM	Density (lb/cf)	Uncontrolled #/PTE	Uncontrolled #VOC	
H2	9.16	10.95	3.73	6.39	7.56	27.64	NA	NA		
CO	10.78	10.51	7.82	10.76	9.97	36.45	0.074	161.83		
N2	36.6	44.1	55.4	44.1	45.05	164.74	NA	NA		
O2	0.76	0.75	0.64	0.76	0.73	2.66	NA	NA		
H2S	<0.03	<0.03	0.269	<0.03	0.07	0.26	0.0911	1.44		
CO2	5.45	5.91	5.04	6.85	5.79	21.16	0.117	148.57		
CH4	16.26	12.15	8.33	11.29	12.01	43.91	0.0424	111.70		
Acetylene	0.01	<0.01	0.03	0.01	0.01	0.05	0.0697	0.19	0.19	
Ethylene	6.06	4.07	5.35	6.22	5.43	19.84	0.0746	88.79	88.79	
Ethane	3.63	2.39	2.65	2.93	2.88	10.51	NA	NA		
Propane	0.611	0.524	0.628	0.472	0.56	2.04	0.1196	14.66	14.66	
Propylene	5.06	3.51	3.24	3.89	3.93	14.35	0.111	95.59	95.59	
Other C4s	0.011	<0.01	0.122	<0.01	0.03	0.12	0.1582	1.15	1.15	
i-Butane	0.021	0.036	0.093	0.061	0.04	0.14	0.1582	1.31	1.31	
n-Butane	0.052	0.06	0.101	0.04	0.06	0.23	0.1582	2.20	2.20	
Butanes	1.51	1	1.29	2.05	1.46	5.33	0.148	47.33	47.33	
Other C5s	0.29	0.231	0.277	0.345	0.28	1.04	0.1904	11.83	11.83	
Neo Pentane	0.114	0.103	0.115	0.116	0.11	0.41	0.1904	4.68	4.68	
i-Pentane	0.004	0.006	0.004	0.004	0.00	0.02	0.1904	0.19	0.19	
n-Pentane	0.088	0.053	0.097	0.094	0.08	0.30	0.1904	3.47	3.47	
1-Pentene	0.111	0.112	0.229	0.128	0.15	0.53	0.1852	5.89	5.89	
Other C6s	0.136	0.119	0.166	0.179	0.15	0.55	0.2274	7.48	7.48	
Hexane +	3.26	3.47	4.38	3.38	3.63	13.26	0.2274	180.86	180.86	(assumed to be HAPs)
Gross HV (dry) (BTU/cf)	761	622	643	868	678.50					
Gross HV (sat) (BTU/cf)	749	611	632	676	666.75					
	99.993	99.954	99.96	99.959	99.98025	365.5286448			485.83	

Constituents Contained in Exhaust Stream to Flare Based on SDS VRU Sampling Performed December 2013

1. A total of four samples were collected and analyzed for gaseous constituents. The table below summarizes each of the four samples in percent by volume on a dry basis.
2. An average value for each gaseous constituent was computed. This was then used to determine the cubic feet per hour of each gas by multiplying the avg % by volume by the dry air flow rate in cfh.
3. The mass emission rate of each constituent was computed by multiplying the cubic feet per hour air flow rate by the vapor density of the constituent.

4. Materials classified as volatile organic compounds (VOCs) were totaled to determine total VOC emissions.
5. Uncontrolled emission rates during sampling and emission factors for regulated air pollutants are summarized below.

Nitrogen Oxides:

AP-42 emission factor (Table 13.5-1) expressed as 0.068 lb/mmBtu
15.40 mmBtu/hr heat input (using average Gross HV (saturated) and the saturated air flow rate)
1.05 lb/hr (controlled and uncontrolled)
0.48 lb/ton (controlled and uncontrolled)

Carbon Monoxide:

161.83 pounds per hour (based on uncontrolled emissions from flare gas analysis above)
73.90 pounds per ton processed (uncontrolled based on gas analysis)
AP-42 emission factor (table 13.5-1) expressed as 0.37 lb/mmBtu
5.70 lb/hr (controlled using AP-42 emission factor)
2.60 lb/ton (controlled using AP-42 emission factor)

VOC:

485.83 pounds per hour
212.61 pounds per ton processed
AP-42 emission factor (Table 13.5-1) expressed as 0.14 lb/mmBtu)
2.16 lb/hr (controlled using AP-42 emission factor)
0.98 lb/ton (controlled using AP-42 emission factor)

HAPs

the Hexane+ category is assumed to be 100% organic HAPs
180.86 pounds per hour
82.58 pounds per ton processed
Control efficiency for HAPs assumed equal to destruction efficiency for VOC
0.84 lb/hr (controlled)
0.38 lb/ton (controlled)

CO2

148.57 pounds per hour (controlled and uncontrolled based on emissions from flare gas analysis above)
67.84 pounds per ton processed (controlled and uncontrolled)

CH4

111.70 pounds per hour (uncontrolled based on uncontrolled emissions from flare gas analysis above)
51.01 pounds per ton processed (uncontrolled based on gas analysis)
Control efficiency for CH4 assumed equal to destruction efficiency for VOC
0.52 pounds per hour (controlled)
0.24 pounds per ton (controlled)

CO2e

Global Warming Potential (GWP) for methane = 25
2941.14 pounds per hour (uncontrolled)
1342.98 pounds per ton processed (uncontrolled)
161.50 pounds per hour (controlled)
73.74 pounds per ton (controlled)

SO2

560.67 mg/m^3 sulfur based on average of three samples collected
1.62 lb/hr SO2 during sampling (controlled and uncontrolled)
0.74 lb SO2 produced per ton of waste processed (controlled and uncontrolled)

HCl

1705 mg/m^3 Cl based on one sample collected
2.53 lb/hr HCl emissions
1.15 pounds per ton (controlled and uncontrolled)
0.6 lb HCl produced per ton of Waste processed (based on analysis for existing SDS unit and anticipated chlorine content of materials processed)

HF

105 mg/m^3 F based on one sample collected
0.16 lb/hr HF emissions
0.07 lb/ton (controlled and uncontrolled)
0.038 lb HF produced per ton of waste processed (based on analysis for existing SDS unit and anticipated fluorine content of materials processed

Appendix A: Emission Calculations
Vapor Recovery Unit - VRU II

Company Name: Tradebe Treatment and Recycling LLC
Source Address: 4343 Kennedy Avenue, East Chicago, IN 46312
Permit Number: T089-35879-00345
Reviewer: Dominic Williams

5	Maximum Throughput (tons of SDS II vapor product/hr)
23827	Limited Throughput (tons of SDS II vapor product/year)
1.48	CO Limit (lb/ton SDS II vapor product processed)

Emissions from VRU II

Pollutant	Uncontrolled Emission Factor (lb/ton SDS II vapor product processed)	Uncontrolled PTE (lb/hr)	Uncontrolled PTE (ton/yr)	Control Efficiency	Controlled Emissions (lb/hr)	Controlled and Limited Emissions (ton/yr)*	Overall Emission Reduction
VOCs	212.6	1063.1	4656.3	98%	21.3	50.7	98.91%
CO	73.9	369.5	1618.3	98%	7.4	17.6	98.91%
Hexane	82.6	412.9	1808.6	98%	8.3	19.7	98.91%
CO2	67.8	339.2	1485.7	0%	339.2	808.2	45.60%
CH4	51.0	255.0	1117.0	98%	5.1	12.2	98.91%
CO2e	1343.0	6714.9	29411.4		NA	NA	

*Emissions limit in order to keep the 2014 Modification to a minor modification for 326 IAC 2-3 (Emission Offset) and 326 IAC 2-2 (PSD).

Emissions created by flare

Pollutant	Emission Factor (lb/ton)	Potential Emissions (lb/hr)	Potential Emissions (ton/yr)
NOx	0.48	2.4	10.5
VOCs	0.98	4.9	21.6
CO	2.60	13.0	57.0
SO2	0.74	3.7	16.2
HCl	0.60	3.0	13.1
HF	0.04	0.2	0.8

Pollutant	Captured CH4 Emissions (lb/ton)	PTE (tons/yr)	GWP	Emissions (ton/yr CO2e)
CO2	51	3,010	1	3,010

Methodology
Uncontrolled PTE (ton/yr) = Emission factor (lb/ton) x Max Throughput (ton/hr) x 8760 hr/yr
Controlled PTE (ton/yr) = Unontrolled PTE (ton/yr) x (1 - Control Eff.)
Limited PTE (ton/yr) = Emission factor (lb/ton) x Limited Throughput (ton/yr) x 1 ton/2000 lb
Limited and Controlled PTE (ton/yr) = Limited PTE (ton/yr) x (1 - Control Eff.)

Appendix A: Emission Calculations
Vapor Recovery Unit - VRU

Company Name: Tradebe Treatment and Recycling LLC
Source Address: 4343 Kennedy Avenue, East Chicago, IN 46312
Permit Number: T089-35879-00345
Reviewer: Dominic Williams

2.5	Maximum Throughput (tons of SDS vapor product/hr)
11686	Limited Throughput (tons of SDS vapor product/year)
1.48	CO Limit (lb/ton SDS vapor product processed)

Emissions from VRU

Pollutant	Uncontrolled Emission Factor (lb/ton SDS vapor product processed)	Uncontrolled PTE (lb/hr)	Uncontrolled PTE (ton/yr)	Control Efficiency	Controlled Emissions (lb/hr)	Controlled and Limited Emissions (ton/yr)	Overall Emission Reduction
VOC	212.6	531.5	2328.1	98%	10.6	24.8	98.93%
CO	73.9	184.7	809.2	98%	3.7	8.6	98.93%
HAPs	82.6	206.5	904.3	98%	4.1	9.7	98.93%
CO2	67.8	169.6	742.8	0%	169.6	396.4	46.64%
CH4	51.0	127.5	558.5	98%	2.6	6.0	98.93%
CO2e	1343.0	3357.5	14705.7		NA	7847.1	

Emissions created by flare

Pollutant	Emission Factor (lb/ton)	Potential Emissions (lb/hr)	Potential Emissions (ton/yr)
NOx	0.48	1.2	5.2
VOC	0.98	2.5	10.8
CO	2.60	6.5	28.5
SO2	0.74	1.8	8.1
HCl	1.15	2.9	12.6
HF	0.07	0.2	0.8

Pollutant	Captured CH4 Emissions (lb/ton)	PTE (tons/yr)	GWP	Emissions (ton/yr CO2e)
CO2	51	1,505	1	1,505

Methodology
Uncontrolled PTE (ton/yr) = Emission factor (lb/ton) x Max Throughput (ton/hr) x 8760 hr/yr
Controlled PTE (ton/yr) = Unontrolled PTE (ton/yr) x (1 - Control Eff.)
Limited PTE (ton/yr) = Emission factor (lb/ton) x Limited Throughput (ton/yr) x 1 ton/2000 lb
Limited and Controlled PTE (ton/yr) = Limited PTE (ton/yr) x (1 - Control Eff.)

Appendix A: Emission Calculations
Tank VOC Emissions

Company Name: Tradebe Treatment and Recycling LLC
Source Address: 4343 Kennedy Avenue, East Chicago, IN 46312
Permit Number: T089-35879-00345
Reviewer: Dominic Williams

P&ID Item description		Tank 81	Tank 82	Tank 83	Tank 84	Tank 85	Tank 87	Tank 86	F-02	F-01	Tank 88	
		Oil/Solvent Product Storage	Oil/Solvent Product Storage	Oil/Solvent Product Storage	Oil/Solvent Product Storage	Process Water	Oil/Solvent Storage	Process Water/Light Sludge Waste Storage	VRU Interceptor	Oil Water Separator	Clean In Place - Acetone*	
Stack ID		SDS II 08	SDS II 08	SDS II 08	SDS II 08	SDS II 07	SDS II 06	SDS II 06	SDS II 03	SDS II 03	SDS II 06	
Tank/Vessel nominal Capacity	Gal	12000	12000	12000	12000	22000	22000	22000	3700	22000	540	
Type		Vertical, cylindrical, cone bottom	Vertical, cylindrical, cone bottom	Vertical, cylindrical, cone bottom	Vertical, cylindrical, cone bottom	Vertical, cylindrical, cone bottom	Vertical, cylindrical, cone bottom	Vertical, cylindrical, cone bottom	Fabricated, flat sided process vessel	Fabricated, flat sided process vessel	Vertical Fixed Roof	
Height	Inches	300	300	300	300	380	380	380	75 approx	110 approx	64	
Diameter	Inches	120	120	120	120	138	138	138	N/A	N/A	42	
Length	Inches	N/A	N/A	N/A	N/A	N/A	N/A	N/A	180 average	450 average	90 average	
Width	Inches	N/A	N/A	N/A	N/A	N/A	N/A	N/A	63 average	105 average	N/A	
Anticipated throughput:												
US gallons/day		1000	1000	1000	1000	3500	2000	3500			36	
Level		Variable	Variable	Variable	Variable	Variable	Variable	Variable	Fixed ~85%	Fixed ~90%	Variable	
Tank material		Carbon Steel	Carbon Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	
Tank color		White	White	Self Colour	Self Colour	Self Colour	Self Colour	Self Colour	Self Colour	Self Colour	White	
Venting to carbon		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Turnovers per year		30.4	30.4	30.4	30.4	58.1	33.2	58.1	24.0	24.0	26.0	
Roof Type (Cone/Dome)		Cone	Cone	Cone	Cone	Cone	Cone	Cone	Cone	Cone	Cone	
Height (feet)		2	2	2	2	2	2	2	2	2	1.25	
Roof Slope		0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.71	
Breather Vent Settings (psig)	Vacuum	-0.045	-0.045	-0.045	-0.045	-0.045	-0.045	-0.045	-0.03	-0.03	-0.03	
Breather Vent Settings (psig)	Pressure	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.03	0.03	0.24	
Site Selection		Chicago, IL	Chicago, IL	Chicago, IL	Chicago, IL	Chicago, IL	Chicago, IL	Chicago, IL	Chicago, IL	Chicago, IL	Chicago, IL	
Tank Contents		Toluene	Toluene	Toluene	Toluene	40% toluene	Toluene	40% toluene	50% Toluene	50% Toluene	Acetone*	
Working Losses (lbs)		211.33	211.33	211.47	211.47	462.63	433.85	518.53	37.70	219.91	41.03	
Breathing Losses (lbs)		9.54	9.54	9.54	9.54	20.65	24.59	24.59	5.54	16.93	4.65	
Total VOC Emissions (lbs)		220.87	220.87	221.01	221.01	483.28	458.44	543.12	43.24	236.84	0	
Total VOC Emissions (tpy) - Maximum Uncontrolled		0.110	0.110	0.111	0.111	0.242	0.229	0.272	0.022	0.118	0	**1.32 Total**
VOC Control Efficiency		98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	none	
Total VOC Emissions (tpy) - Maximum Controlled		0.0022	0.0022	0.0022	0.0022	0.0048	0.0046	0.0054	0.0004	0.0024	0	**0.03 Total (controlled)**

Emissions calculated from EPA TANKS data
*Acetone is not a volatile organic compound (VOC) or hazardous air pollutant (HAP). Acetone was exempted from the definition of volatile organic compounds (VOC) under 40 CFR 51.100 (Definitions).

Appendix A: Emission Calculations
Cooling Tower

Company Name: Tradebe Treatment and Recycling LLC
Source Address: 4343 Kennedy Avenue, East Chicago, IN 46312
Permit Number: T089-35879-00345
Reviewer: Dominic Williams

Stack ID **Insignficant**
Source Name **Cooling Tower**

Operating Parameters			Note
Water Circulation Rate of all cells (R)	1,200	gpm	
Total Liquid Drift (S)	0.005	%	
Density of Water (D)	8.3453	lb/gal	
Expected TDS/TSS of Circulated Water (C)	5000	ppmw	
Operating Time:	24	(hr/day)	
	8760	(hr/year)	

Pollutant	Emission Factor	Unit	Emission Rate		Note
			(lb/hr)	(tpy)	
PM	2.09E-03	lb/10^3 gal	0.15	0.66	1
PM10	29.97	% of PM	0.05	0.20	2
PM2.5	0.18	% of PM	2.65E-04	1.16E-03	2

Notes:
(1) USEPA AP-42, Chapter 13.4 *Wet Cooling Towers*, Table 13.4-1 [EF (lb/1000 gal) = 1,000*D*(S/100)*(C/1,000,000)]
(2) Calculating Realistic PM10 Emissions from Cooling Towers, Joel Reisman and Gordon Frisbie, Environmental Progress (Vol 21, No 2), July 2002

Max TDS = 5,000 ppmw

EPRI Droplet Diameter (µm)	Droplet Volume (μm^3)	Droplet Mass (µg)	Particle Mass (solids) (µg)	Solid Particle Volumne (μm^3)	Solid Particle Diameter (µm)	EPRI % Mass Smaller	
10	524	5.24E-04	2.62E-06	1.19	1.315	0.000	
				Interpolation --->	**2.500**	**0.177**	**0.177 % of PM is PM2.5**
20	4189	4.19E-03	2.09E-05	9.52	2.630	0.196	
30	14137	1.41E-02	7.07E-05	32.13	3.944	0.226	
40	33510	3.35E-02	1.68E-04	76.16	5.259	0.514	
50	65450	6.54E-02	3.27E-04	148.75	6.574	1.816	
60	113097	1.13E-01	5.65E-04	257.04	7.889	5.702	
70	179594	1.80E-01	8.98E-04	408.17	9.203	21.348	
				Interpolation --->	**10.000**	**29.971**	**29.971 % of PM is PM10**
90	381704	3.82E-01	1.91E-03	867.51	11.833	49.812	
110	696910	6.97E-01	3.48E-03	1583.89	14.462	70.509	
130	1150347	1.15E+00	5.75E-03	2614.42	17.092	82.023	
150	1767146	1.77E+00	8.84E-03	4016.24	19.722	88.012	
180	3053628	3.05E+00	1.53E-02	6940.06	23.666	91.032	
210	4849048	4.85E+00	2.42E-02	11020.56	27.610	92.468	
240	7238229	7.24E+00	3.62E-02	16450.52	31.554	94.091	
270	10305995	1.03E+01	5.15E-02	23422.72	35.499	94.689	
300	14137167	1.41E+01	7.07E-02	32129.92	39.443	96.288	
350	22449298	2.24E+01	1.12E-01	51021.13	46.017	97.011	
400	33510322	3.35E+01	1.68E-01	76159.82	52.591	98.34	
450	47712938	4.77E+01	2.39E-01	108438.50	59.165	99.071	
500	65449847	6.54E+01	3.27E-01	148749.65	65.738	99.071	
600	113097336	1.13E+02	5.65E-01	257039.40	78.886	100.000	

Calculations based on approach presented in: Calculating Realistic PM10 Emissions from Cooling Towers
Joel Reisman and Gordon Frisbie, Environmental Progress (Vol 21, No 2), July 2002

Appendix A: Emissions Calculations
VOC and HAP
From HWF Tank Storage (Unit 1)

Company Name: Tradebe Treatment and Recycling LLC
Source Address: 4343 Kennedy Avenue, East Chicago, IN 46312
Permit Number: T089-35879-00345
Reviewer: Dominic Williams

				Unscaled			Scaled (up to 52 wk/yr)		
Tank #	Capacity (gal)	Actual Throughput (gpy)	Max Throughput (gpy)	Uncontrolled VOC Emissions, lb/yr (TANKS 4.0)	Uncontrolled VOC Emissions, ton/yr	Controlled VOC Emissions, ton/yr	Uncontrolled VOC Emissions, lb/yr (TANKS 4.0)	Uncontrolled VOC/HAP Emissions, ton/yr	Controlled VOC/HAP Emissions, ton/yr
29[a]	20,057	501,425	1,002,850	1,933	0.97	0.010	2,010	1.01	0.010
1R	12,690		1,625,000	1,432	0.72	0.007	1,432	0.72	0.007
4	12,690		1,625,000	1,432	0.72	0.007	1,432	0.72	0.007
18	20,353		1,625,000	2,027	1.01	0.010	2,027	1.01	0.010
19	20,353		1,625,000	2,027	1.01	0.010	2,027	1.01	0.010
20	20,353		1,625,000	2,027	1.01	0.010	2,027	1.01	0.010
21	20,353		1,625,000	2,027	1.01	0.010	2,027	1.01	0.010
22	20,353		1,625,000	2,027	1.01	0.010	2,027	1.01	0.010
23	20,353		1,625,000	2,027	1.01	0.010	2,027	1.01	0.010
6	4,386		228,072	424	0.21	0.002	424	0.21	0.002
7	2,900		150,800	275	0.14	0.001	275	0.14	0.001
			TOTAL ALL TANKS	17,658	8.83	0.088	17,735	**8.87**	**0.089**

[a]source assumed one turnover per week, 50 weeks per year. Emissions from this tank are scaled up to 52 weeks per year.

Note: Above calcultions are from permit number T 089-29424-00345, issued on February 25, 2011.

Appendix A: Emissions Calculations
VOC and HAP
Area 2 Receiving and Shipping and Area 8/10 Receiving and Shipping

Company Name: Tradebe Treatment and Recycling LLC
Source Address: 4343 Kennedy Avenue, East Chicago, IN 46312
Permit Number: T089-35879-00345
Reviewer: Dominic Williams

Area 2 Receiving and Shipping and Area 8/10 Receiving and Shipping

Area 2 Receiving and Shipping, consisting of Area 2 truck dock (Area 1, Area 2 and rail line slots 1-7)
Area 8/10 Receiving and Shipping, consisting of Area 8/10 (Area 8 truck dock and rail line slots 8-10)

VOC emissions are estimated using following equation, from Section 5.2 of AP-42:

$L_L = 12.46 * (S*P*M)/T$
LL = Loading loss per kgal liquid loaded
S = saturation factor (from Table 5.2-1 of AP-42)
P = true vapor pressure of liquid load (psia)
M = molecular weight of vapors (lb/lb-mole)
T = temperature of bulk liquid loaded (deg. R)

S =	0.6	Submerged loading: dedicated normal service
P =	0.97	psia
M =	75	lb/lb-mole
T =	530	R (70 oF)
Loading Loss Emission Factor, L_L =	1.03	lb VOC/kgal

	Area 2 Receiving and Shipping	Area 8/10 Receiving and Shipping	
Area 2 Receiving and Shipping Maximum Throughput =	13,200	17,200	gal/hour
Area 2 Receiving and Shipping Maximum Throughput =	115,632,000	150,672,000	gal/year
Area 2 Potential VOC/HAP (Before Control)* =	59.3	77.3	tons/year
Carbon Canister VOC Control Efficiency =	98.0%	98.0%	
Area 2 Potential VOC/HAP (After Control)* =	1.19	1.55	tons/year
Area 2 Receiving and Shipping Limited Throughput =	41,450,000	41,450,000	gal/year
Limited VOC/HAP Emissions (Before Control)* =	21.3	21.3	tons/year

Methodology:
Maximum Throughput (gal/year) = Maximum Throughput (gal/hour) x 8760 hours/year
Potential VOC/HAP (Before Control) (ton/yr) = Loading Loss Emission Factor (lb/kgal) * (kgal/1000 gal) x Maximum Throughput (gal/year) x ton/2000 lb
Limited VOC/HAP Emissions (ton/year) (Before Control) = Loading Loss Emission Factor (lb/kgal) *(kgal/1000 gal) x Limited Throughput (gal/year) x ton/2000 lb
*As a worst case scearnio, VOC emissions are assumed to be 100% Toluene (HAP).

Appendix A: Emissions Calculations
VOC and HAP
Hydropulper Tank (Tank 24HP)

Company Name: Tradebe Treatment and Recycling LLC
Source Address: 4343 Kennedy Avenue, East Chicago, IN 46312
Permit Number: T089-35879-00345
Reviewer: Dominic Williams

Hydropulper Tank (Tank 24HP)

Tank 24HP is operated on a batch process. The tank is filled, and then pumped into other tanks in Area 2.

(max production)	
2,310	gallons (working)
6	hrs (to fill)
385	gals/hr

Dimensions

	diameter	sidewall	dome	bottom
	9	6	1.5	1.5
volume	3,010			
volume working	*2,310*			

max production (worst case emissions) annual	
385	gals/hr
8401	# Hrs /Yr (SERVICE FACTOR)
3,234,323	gals/yr

HP24 Throughput (in gallons)

	hourly	**annual**
PTE	**385**	**3,234,323**
HP 24 filled	6	hours
contents transferred	0.33	hours

service factor calculation

7.67 hrs process, .33 hrs transfer from HP 24 to Area
7.67 / 8 = 95.9 % operation

8760	x	95.90%	=	8401 hours of operation / year

check service factor

385	8760	95.90%	3,234,323	gals /yr

Production based "ACTUAL" numbers

2013 11 months	**lbs/gal**	**gallons**			**gals/mth**		**gals/ yr cal**	**hrs /yr**	**gals/hr**
8,367,368	**8.34**	**1,003,282**	/	**11**	**91,207**	**x 12 =**	**1,094,489**	**2944**	**372**

gals		time to empty		gals/min
2310	/	20	=	115.5

Potential Emissions

2310 gallons per filling event
3,234,323 max gallons per year
1400 max filling events per year

Compute emissions using liquid loading loss equation from AP-42 Section 5.2

LL = 12.46 (S*P*M)/T
where:
LL = Liquid loading uncontrolled emission factor in lb/1000 gallons
S = Saturation Factor (use worst case factor of 1.45)
P = true vapor pressure (use worst case factor for tolune of 0.435 @ 70 deg F)
M = molecular weight of vapors (use mw of toluene, 92.13)
T = Temperature of liquid (deg R) (assume ambient temp of 70 deg F, 530 deg R)

LL =	1.37	lb/1000 gal
Annual uncontrolled emissions =	4418.6	lbs/yr
	2.21	tons/yr
Annual Controlled Emissions =	98%	(controlled using carbon canisters; assumed 98% efficient)
	88.4	lbs/yr
	0.022	tons/yr

Appendix A: Emissions Calculations
VOC and HAP
Unit 4 (Lab Pack Booths 1 and 4)

Company Name: Tradebe Treatment and Recycling LLC
Source Address: 4343 Kennedy Avenue, East Chicago, IN 46312
Permit Number: T089-35879-00345
Reviewer: Dominic Williams

Emissions from organic liquid depacking (Lab Pack Booth 1 of Unit 4)

Organic liquids are depacked in Lab Pack Booth 1. 3.06
Max 27375 containers/yr
Assumptions[a]:
75.5 gal/hr
7.5 lb/gal average density of depacked liquids

Uncontrolled emissions were expected to be low (materials are not agitated, heated, or exposed for long periods of time).
Estimate of emissions as % of quantity depacked: 0.10%

75.5 gal/hr * 7.5 lb/gal * 0.1% = 0.56625 lb VOC/hr **2.48 TPY VOC/HAP uncontrolled**

Estimated control efficiency of carbon adsorber packs: 98% **0.05 TPY VOC/HAP controlled**

[a] These figures are estimates. Lab Pack Booth 1 can also vent gaseous emissions from cylinders. However, the depacking of organic liquids is a worst case emissions scenario and therefore presented here.

Emissions from the packing of dry chemicals (Lab Pack Booth 4 of Unit 4) - insignificant activity

Baghouse information:

Amount of particulate captured by baghouse per year:	275 lbs
Operating schedule of baghouse:	2,080 hrs/yr
Estimated capture efficiency of baghouse:	99.90%

(8 hrs/day, 5 days/week, 52 weeks/yr)

Calculations:
Amount of particulate captured by baghouse per 8,760 hrs:
275 lbs * (8,760 hrs/yr)/(2,080 hrs/yr) * 1 ton/2,000 lbs = 0.58 tons PM/yr

Estimated uncontrolled particulate emissions per 8,760 hours:
0.58 tons PM/yr / (1/0.999) = **0.58** tons PM/yr uncontrolled

Estimated controlled particulate emissions per 8,760 hours:
0.58 tons PM/yr * (1 - 0.999) = **0.0006** tons PM/yr controlled

Note: Above calcultions are from pemit number T 089-29424-00345, issued on February 25, 2011.

Appendix A: Emissions Calculations
VOC from Degassing Operation

Company Name: Tradebe Treatment and Recycling LLC
Source Address: 4343 Kennedy Avenue, East Chicago, IN 46312
Permit Number: T089-35879-00345
Reviewer: Dominic Williams

Emissions from Degassing Unit (After installation of flare)

Type	Maximum Gas VOC Throughput* ton/yr	Maximum Gas HAP Throughput* ton/yr	VOC/HAP Absorbed %	Potential VOC Emissions Before Flare Control (tons/yr)	Potential HAP Emissions Before Flare Control (tons/yr)	Flare Control Efficiency %	Potential VOC Emissions After Flare Control (tons/yr)	Potential HAP Emissions After Flare Control (tons/yr)
Absorbable organics	396.8	14.1	98%	7.9	0.28	98%	0.2	0.01
Light end hydrocarbons	9.0	--	0%	9.0	--	98%	0.2	--
Totals:	405.8			**17.0**			**0.3**	**0.01**

Emissions from Degassing Unit (Prior to installation of flare)

Unit	Maximum Gas VOC Throughput* ton/yr	Maximum Gas HAP Throughput* ton/yr	VOC/HAP Absorbed %	Potential VOC Emissions Before Carbon Adsorber Control (tons/yr)	Potential HAP Emissions Before Carbon Adsorber Control (tons/yr)	Carbon Adsorber Unit Efficiency %	Potential VOC Emissions After Carbon Adsorber Control (tons/yr)	Potential HAP Emissions After Carbon Adsorber Control (tons/yr)
Degassing	198.4	3.1	98%	4.0	0.06	98%	0.1	0.00

*Estimated maximum throughput provided by source based on historic mix of actual cylinders processed. 'Absorbable' gases processed include organic, inorganic, halogenated and inert.
Potential VOC/HAP Emissions Before Flare Control (ton/yr) = Maximum Gas Throughput VOC/HAP (ton/yr) x (1 -VOC/HAP Condensed (%))
Potential VOC/HAP Emissions After Flare Control (ton/yr) = Potential VOC/HAP Emissions Before Flare Control (ton/yr) * (1 - Flare Control Effiency)
Note: Inorganic HAPs are Chlorine and Fluorine and Organic HAPs include 1,3 butadiene, ethylene oxide and others.
Note: The degassing operation includes a reactor tank into which gasses are vented and a pressurized “shock” tank that will condense gasses into liquids for collection and offsite shipment, with remaining gasses controlled by a flare or carbon cannisters.

Note: The use of a flare control system allows cylinders to be degassed more quickly, as the flare can handle a higher air flow rate than is possible with carbon canisters. Further increases in throughput could only be accomplished through a change to a larger reactor or by the installation of a flare that could handle a higher air flow rate.
Note: The addition of a flare control system now allows for the degassing of cylinders containing light end hydrocarbons. These gases are not absorbed into liquid by the shock tank, and therefore assumed to be 100% emitted as VOC (0% absorbed).

Appendix A: Emission Calculations

VOC and HAP

From the SDS Shredder (SDS)

Company Name: Tradebe Treatment and Recycling LLC
Source Address: 4343 Kennedy Avenue, East Chicago, IN 46312
Permit Number: T089-35879-00345
Reviewer: Dominic Williams

From the SDS Shredder (SDS)
Process Description:

Max. Throughput Rate: 4.0 tons/hr
VOC Emission Factor: 0.15 lbs/ton (This is provided by the source, based on the stack test results from a similar unit)

Control Equipment: Carbon Adsorption System for VOC/HAP Control
Control Efficiency: 98.0%

Potential to Emit VOC/HAP before Control:

Assume all the VOC emissions are equal to HAP emissions because the HAP contents in the received waste very greatly.

PTE of VOC/HAP before Control = 4 tons/hr x 0.15 lbs/ton x 8760 hr/yr x 1 ton/2000 lbs = **2.63 tons/yr**

Potential to Emit VOC/HAP after Control:

PTE of VOC/HAP after Control = 4 tons/hr x 0.15 lbs/ton x 8760 hr/yr x 1 ton/2000 lbs x (1- 98%) = **0.05 tons/yr**

VOC	**Limited**	0.028	lb/hr
SDS Shredder		**0.12**	ton/yr

From the SDS Shaker and conveyor
Potential to Emit PM After Control:

Unit	Maximum Air Flow (acfm)	Design Outlet Grain Loading (gr/acf)	Overall control efficiency	After Control Emissions (lb/hr)	After Control Emissions (ton/yr)	Before Control Emissions (lb/hr)	Before Control Emissions (ton/yr)
SDS 04	4400	0.03	90%	1.13	5.0	11.31	49.6
SDS 09	2500	0.03	90%	0.64	2.8	6.43	28.2
Total					7.8		77.7

Note: These emissions were previously calculated based on maximum air flow of 500 acfm.

Assume all the PM emissions are equal to PM10 emissions.

Appendix A: Emission Calculations

Natural Gas Combustion

(MMBtu/hr < 100)

From the NG Combustion in Anaerobic Thermal Desorption Unit (ATDU)

Company Name: Tradebe Treatment and Recycling LLC
Source Address: 4343 Kennedy Avenue, East Chicago, IN 46312
Permit Number: T089-35879-00345
Reviewer: Dominic Williams

Heat Input Capacity MMBtu/hr	Potential Throughput MMCF/yr
15.6	136.7

	Pollutant						
	PM*	PM10*	PM2.5	SO_2	**NO_x	VOC	CO
Emission Factor in lb/MMCF	1.9	7.6	7.6	0.6	100	5.5	84.0
Potential to Emit in tons/yr	**0.13**	**0.52**	**0.52**	**0.04**	**6.83**	**0.38**	**5.74**

*PM and PM10 emission factors are condensable and filterable PM10 combined.

**Emission Factors for NO_x: Uncontrolled = 100.

Emission factors are from AP-42, Chapter 1.4, Tables 1.4-1, 1.4-2,
and 1.4-3, SCC #1-02-006-02, 1-01-006-02, 1-03-006-02, and 1-03-006-03
(AP-42 Supplement D 3/98)

Methodology

All Emission factors are based on normal firing.
MMBtu = 1,000,000 Btu
MMCF = 1,000,000 Cubic Feet of Gas
Potential Throughput (MMCF/yr) = Heat Input Capacity (MMBtu/hr) x 8,760 hrs/yr x 1 MMCF/1,000 MMBtu
Potential to Emit (tons/yr) = Potential Throughput (MMCF/yr) x Emission Factor (lb/MMCF)/2,000 lb/ton
Note: Above calcultions are from pemit number T 089-29424-00345, issued on February 25, 2011.

HAPS Calculations

	HAPs - Organics					
	Benzene	Dichlorobenzene	Formaldehyde	Hexane	Toluene	**Total - Organics**
Emission Factor in lb/MMcf	2.10E-03	1.20E-03	7.50E-02	1.80E+00	3.40E-03	
Potential Emission in tons/yr	1.4E-04	8.2E-05	5.1E-03	0.12	2.3E-04	**0.13**

	HAPs - Metals					
	Lead	Cadmium	Chromium	Manganese	Nickel	**Total - Metals**
Emission Factor in lb/MMcf	5.00E-04	1.10E-03	1.40E-03	3.80E-04	2.10E-03	
Potential Emission in tons/yr	3.4E-05	7.5E-05	9.6E-05	2.6E-05	1.4E-04	**3.7E-04**
					Total HAPs	**0.13**
					Worst HAP	**0.12**

Methodology is the same as above.
The five highest organic and metal HAPs emission factors are provided above.
Additional HAPs emission factors are available in AP-42, Chapter 1.4.

Greenhouse Gas Calculations

	Greenhouse Gas*		
	CO2	CH4	N2O
Emission Factor in lb/MMcf	120,000	2.3	2.2
Potential Emission in tons/yr	8,199	0	0
Summed Potential Emissions in tons/yr	8,200		
CO2e Total in tons/yr	8,248		

Methodology

The N2O Emission Factor for uncontrolled is 2.2. The N2O Emission Factor for low Nox burner is 0.64.
Emission Factors are from AP 42, Table 1.4-2 SCC #1-02-006-02, 1-01-006-02, 1-03-006-02, and 1-03-006-03.
Global Warming Potentials (GWP) from Table A-1 of 40 CFR Part 98 Subpart A.
Emission (tons/yr) = Throughput (MMCF/yr) x Emission Factor (lb/MMCF)/2,000 lb/ton
*CO2e (tons/yr) based on 11/29/2013 federal GWPs= CO2 Potential Emission ton/yr x CO2 GWP (1) + CH4 Potential Emission ton/yr x CH4 GWP (25) + N2O Potential Emission ton/yr x N2O GWP (298).

Appendix A: Emission Calculations
VOC and HAP Emissions
From the Distillation Unit

Company Name: Tradebe Treatment and Recycling LLC
Source Address: 4343 Kennedy Avenue, East Chicago, IN 46312
Permit Number: T089-35879-00345
Reviewer: Dominic Williams

Process Description:

Max. Throughput Rate:		1.0 ton/hr	
VOC Emission Factor:		0.52 lbs/ton	(This is provided by the manufacturer)
Control Equipment:	Carbon Adsorption System for VOC/HAP Control		
Control Efficiency:		98.0%	

Potential to Emit VOC/HAP before Control:

Assume all the VOC emissions are equal to HAP emissions because the HAP contents in the received waste very greatly.

PTE of VOC/HAP before Control = 1 tons/hr x 0.52 lbs/ton x 8760 hr/yr x 1 ton/2000 lbs = **2.28 tons/yr**

Potential to Emit VOC/HAP after Control:

PTE of VOC/HAP after Control = 1 tons/hr x 0.52 lbs/ton x 8760 hr/yr x 1 ton/2000 lbs x (1- 98%) = **0.05 tons/yr**

Note: Above calcultions are from pemit number T 089-29424-00345, issued on February 25, 2011.

	Limited	
	lb/hr	ton/yr
Distillation Unit	0.014	0.06

Appendix A: Emission Calculations
Tank VOC Emissions

Company Name: Tradebe Treatment and Recycling LLC
Source Address: 4343 Kennedy Avenue, East Chicago, IN 46312
Permit Number: T089-35879-00345
Reviewer: Dominic Williams

Emission Unit	Tank Volume	Working Loss	Breathing Loss	VOC Total Emissions					
	Gallons	lbs/year	lbs/year	lbs/year	TPY	Control Efficiency	Controlled TPY	lbs/day	lbs/hr
52	12,000	77.8	0.0	77.8	0.04	98%	0.001	0.21	0.01
53	12,000	77.8	0.0	77.8	0.04	98%	0.001	0.21	0.01
54	12,000	77.8	0.0	77.8	0.04	98%	0.001	0.21	0.01
55	20,000	646.9	206.2	853.1	0.43	98%	0.009	2.34	0.10
	Tanks 52-55		**Total**	1086.5	**0.5**		**0.01**		

Emission Unit	Tank Volume	Working Loss	Breathing Loss	VOC Total Emissions					
	Gallons	lbs/year	lbs/year	lbs/year	TPY	Control Efficiency	Controlled TPY	lbs/day	lbs/hr
57	20,000	646.9	206.2	853.1	0.43	98%	0.009	2.34	0.10
58	20,000	646.9	206.2	853.1	0.43	98%	0.009	2.34	0.10
59	6,000	360.9	0.0	360.9	0.18	98%	0.004	0.99	0.04
60	6,000	360.9	0.0	360.9	0.18	98%	0.004	0.99	0.04
61	20,000	646.9	206.2	853.1	0.43	98%	0.009	2.34	0.10
62	12,000	77.8	0.0	77.8	0.04	98%	0.001	0.21	0.01
63	12,000	77.8	0.0	77.8	0.04	98%	0.001	0.21	0.01
64	12,000	77.8	0.0	77.8	0.04	98%	0.001	0.21	0.01
65	12,000	77.8	0.0	77.8	0.04	98%	0.001	0.21	0.01
66	12,000	77.8	0.0	77.8	0.04	98%	0.001	0.21	0.01
67	12,000	77.8	0.0	77.8	0.04	98%	0.001	0.21	0.01
	Tanks 57-67		**Total**	3747.9	**1.9**		**0.04**		

Methodology
Each tank uses a carbon adsorption system for control.
Note: Storage tank emissions are estimated using USEPA's Tanks 4.0.9D software program and provided by the source.

Appendix A: Emissions Calculations
VOC and HAP
Pot Still

Company Name: Tradebe Treatment and Recycling LLC
Source Address: 4343 Kennedy Avenue, East Chicago, IN 46312
Permit Number: T089-35879-00345
Reviewer: Dominic Williams

Tradebe Pot Still Minor Source Modification Emissions Calculations

2013 Pot Still Data	
Max Capacity (gal/hr)	70
Hrs Operation (hr/yr)	6607
Throughput (gal/yr)	326032
VOC Adsorption Rate (lb VOC/lb carbon)	0.25
Control Efficiency (99%)	99.0%
Carbon Used (lbs)	10800
Total Changeouts per year	54
Carbon/Changeout (lbs)	200
Actual Gallons/Hour	49.35
Carbon Used/gal (lbs/gal)	0.033

Proposed Modified Unit	
Modified Capacity (gal/hr)	115
Max Hrs Operation (hr/yr)	8760
Max Throughput (gal/yr)	1007400
VOC Adsorption Rate (lb VOC/lb carbon)	0.25
Control Efficiency (98%)	98.0%
Est Max Carbon Used (lbs)	33370.7
Est Max Changeouts per year	166.9
Carbon/Changeout (lbs)	200

	2013 Actual Data	Potential VOC Emissions (Modified Unit)	Potential HAP Emissions (Modified Unit)*
Uncontrolled VOC Emissions (lbs/yr)	2700.0	8342.7	8342.7
Controlled VOC Emissions (lbs/yr)	27.0	166.9	166.9
Uncontrolled VOC Emissions (lbs/gal)	0.0083	0.0083	0.0083
Controlled VOC Emissions (lbs/gal)	8.28E-05	1.66E-04	1.66E-04

	2013 Actual Data	Potential VOC Emissions (Modified Unit)	Potential HAP Emissions (Modified Unit)*
Total Uncontrolled VOC Emissions (tons/yr)	1.35	4.17	4.17
Total Controlled VOC Emissions (tons/yr)	0.01	0.08	0.08

*Based on conservative assumption, HAPs emissions are assumed equal to VOC emissions.
Potential to emit was back calculated from 2013 carbon usage.
Uncontrolled VOC Emissions (lbs/yr) = Total Changeouts/year x lbs carbon/Changeout x VOC Adsorption Rate (lb VOC/lb carbon)
Controlled VOC Emissions (lbs/yr) = Uncontrolled VOC Emissions (lbs/yr) * (1 - Control Efficiency)
Uncontrolled VOC Emissions (lbs/gal) = Uncontrolled VOC Emissions (lbs/yr) / Throughput (gal/yr)
Controlled VOC Emissions (lbs/gal) = Uncontrolled VOC Emissions (lbs/gal) * (1- Control Efficiency)
Total Uncontrolled VOC Emissions (tons/yr) = Total Uncontrolled VOC PTE (lbs/yr) / 2000 lbs/ton
Total Controlled VOC Emissions (tons/yr) = Total Uncontrolled VOC PTE (tons/yr) * (1- Control Efficiency)

Appendix A: Emission Calculations
Natural Gas Combustion (MMBtu/hr < 100)

Company Name: Tradebe Treatment and Recycling LLC
Source Address: 4343 Kennedy Avenue, East Chicago, IN 46312
Permit Number: T089-35879-00345
Reviewer: Dominic Williams

Thin Film Evaporator

Heat Input Capacity MMBtu/hr	Potential Throughput MMCF/yr
2.4	21.0

	Pollutant						
Combustion	PM*	PM10*	PM2.5	SO_2	**NO_x	VOC	CO
Emission Factor in lb/MMCF	1.9	7.6	7.6	0.6	100	5.5	84.0
Potential to Emit in tons/yr	**0.02**	**0.08**	**0.08**	**0.01**	**1.05**	**0.06**	**0.88**
					Additional VOC	**0.03**	
					Total VOC	**0.09**	

*PM and PM10 emission factors are condensable and filterable PM10 combined.
**Emission Factors for NO_x: Uncontrolled = 100.

Emission factors are from AP-42, Chapter 1.4, Tables 1.4-1, 1.4-2, and 1.4-3, SCC #1-02-006-02, 1-01-006-02, 1-03-006-02, and 1-03-006-03 (AP-42 Supplement D 3/98)

Methodology
All Emission factors are based on normal firing.
MMBtu = 1,000,000 Btu
MMCF = 1,000,000 Cubic Feet of Gas
Potential Throughput (MMCF/yr) = Heat Input Capacity (MMBtu/hr) x 8,760 hrs/yr x 1 MMCF/1,000 MMBtu
Potential to Emit (tons/yr) = Potential Throughput (MMCF/yr) x Emission Factor (lb/MMCF)/2,000 lb/ton

HAPS Calculations

	HAPs - Organics					
	Benzene	Dichlorobenzene	Formaldehyde	Hexane	Toluene	**Total - Organics**
Emission Factor in lb/MMcf	2.10E-03	1.20E-03	7.50E-02	1.80E+00	3.40E-03	
Potential Emission in tons/yr	2.2E-05	1.3E-05	7.9E-04	0.02	3.6E-05	**0.02**

	HAPs - Metals					
	Lead	Cadmium	Chromium	Manganese	Nickel	**Total - Metals**
Emission Factor in lb/MMcf	5.00E-04	1.10E-03	1.40E-03	3.80E-04	2.10E-03	
Potential Emission in tons/yr	5.3E-06	1.2E-05	1.5E-05	4.0E-06	2.2E-05	**5.8E-05**
					Total HAPs	**0.02**
					Worst HAP	**0.02**

Methodology is the same as above.
The five highest organic and metal HAPs emission factors are provided above.
Additional HAPs emission factors are available in AP-42, Chapter 1.4.

Greenhouse Gas Calculations

	Greenhouse Gas*		
	CO2	CH4	N2O
Emission Factor in lb/MMcf	120,000	2.3	2.2
Potential Emission in tons/yr	1,261	0.02	0.02
Summed Potential Emissions in tons/yr	1,261		
CO2e Total in tons/yr	1,269		

Methodology
The N2O Emission Factor for uncontrolled is 2.2. The N2O Emission Factor for low Nox burner is 0.64.
Emission Factors are from AP 42, Table 1.4-2 SCC #1-02-006-02, 1-01-006-02, 1-03-006-02, and 1-03-006-03.
Global Warming Potentials (GWP) from Table A-1 of 40 CFR Part 98 Subpart A.
Emission (tons/yr) = Throughput (MMCF/yr) x Emission Factor (lb/MMCF)/2,000 lb/ton
*CO2e (tons/yr) based on 11/29/2013 federal GWPs= CO2 Potential Emission ton/yr x CO2 GWP (1) + CH4 Potential Emission ton/yr x CH4 GWP (25) + N2O Potential Emission ton/yr x N2O GWP (298).

Appendix A: Emission Calculations
Natural Gas Combustion (MMBtu/hr < 100)

Company Name: Tradebe Treatment and Recycling LLC
Source Address: 4343 Kennedy Avenue, East Chicago, IN 46312
Permit Number: T089-35879-00345
Reviewer: Dominic Williams

Hot Oil Heater

Heat Input Capacity MMBtu/hr	Potential Throughput MMCF/yr
2.5	21.9

	Pollutant						
	PM*	PM10*	PM2.5	SO_2	**NO_x	VOC	CO
Emission Factor in lb/MMCF	1.9	7.6	7.6	0.6	100	5.5	84.0
Potential to Emit in tons/yr	**0.02**	**0.08**	**0.08**	**0.01**	**1.10**	**0.06**	**0.92**

*PM and PM10 emission factors are condensable and filterable PM10 combined.
**Emission Factors for NO_x: Uncontrolled = 100.

Emission factors are from AP-42, Chapter 1.4, Tables 1.4-1, 1.4-2, and 1.4-3, SCC #1-02-006-02, 1-01-006-02, 1-03-006-02, and 1-03-006-03 (AP-42 Supplement D 3/98)

Methodology
All Emission factors are based on normal firing.
MMBtu = 1,000,000 Btu
MMCF = 1,000,000 Cubic Feet of Gas
Potential Throughput (MMCF/yr) = Heat Input Capacity (MMBtu/hr) x 8,760 hrs/yr x 1 MMCF/1,000 MMBtu
Potential to Emit (tons/yr) = Potential Throughput (MMCF/yr) x Emission Factor (lb/MMCF)/2,000 lb/ton

HAPS Calculations

	HAPs - Organics					
	Benzene	Dichlorobenzene	Formaldehyde	Hexane	Toluene	**Total - Organics**
Emission Factor in lb/MMcf	2.10E-03	1.20E-03	7.50E-02	1.80E+00	3.40E-03	
Potential Emission in tons/yr	2.3E-05	1.3E-05	8.2E-04	0.02	3.7E-05	**0.02**

	HAPs - Metals					
	Lead	Cadmium	Chromium	Manganese	Nickel	**Total - Metals**
Emission Factor in lb/MMcf	5.00E-04	1.10E-03	1.40E-03	3.80E-04	2.10E-03	
Potential Emission in tons/yr	5.5E-06	1.2E-05	1.5E-05	4.2E-06	2.3E-05	**6.0E-05**
					Total HAPs	**0.02**
					Worst HAP	**0.02**

Methodology is the same as above.
The five highest organic and metal HAPs emission factors are provided above.
Additional HAPs emission factors are available in AP-42, Chapter 1.4.

Greenhouse Gas Calculations

	Greenhouse Gas*		
	CO2	CH4	N2O
Emission Factor in lb/MMcf	120,000	2.3	2.2
Potential Emission in tons/yr	1,314	0.03	0.02
Summed Potential Emissions in tons/yr	1,314		
CO2e Total in tons/yr	1,322		

Methodology
The N2O Emission Factor for uncontrolled is 2.2. The N2O Emission Factor for low Nox burner is 0.64.
Emission Factors are from AP 42, Table 1.4-2 SCC #1-02-006-02, 1-01-006-02, 1-03-006-02, and 1-03-006-03.
Global Warming Potentials (GWP) from Table A-1 of 40 CFR Part 98 Subpart A.
Emission (tons/yr) = Throughput (MMCF/yr) x Emission Factor (lb/MMCF)/2,000 lb/ton
*CO2e (tons/yr) based on 11/29/2013 federal GWPs= CO2 Potential Emission ton/yr x CO2 GWP (1) + CH4 Potential Emission ton/yr x CH4 GWP (25) + N2O Potential Emission ton/yr x N2O GWP (298).

Appendix A: Emissions Calculations
Fugitive PM
From Paved/Unpaved Roads and Storage Piles

Company Name: Tradebe Treatment and Recycling LLC
Source Address: 4343 Kennedy Avenue, East Chicago, IN 46312
Permit Number: T089-35879-00345
Reviewer: Dominic Williams

Truck Dumping
E = k(0.0032) * (U/5)^1.3 / (M/2)^1.4

E = Emission Factor (lbs/ton)
k = 0.35 particle size multilplier for PM-10
0.74 particle size multilplier for PM
U = 10.3 mean wind speed (mph)
M = 5 material moisture content (fraction)

PM Emission Factor:
E = 0.00168 lb/ton

PM-10 Emission Factor:
E = (0.35)(0.0032) * (12.7/5)^1.3 / (10%/2)^1.4
E = 0.00079 lb/ton

Annual potential amount of dry material delivered by truck = 1980 tpy
Potential PM Emissions (tons/year) = Emission factor (lb/ton) * Gypsum delivered (tpy) / 2000 (lbs/ton)
Potential PM Emissions (tons/year) = **0.0017 tpy**
Potential PM-10 Emissions (tons/year) = Emission factor (lb/ton) * Gypsum delivered (tpy) / 2000 (lbs/ton)
Potential PM-10 Emissions (tons/year) = **0.0008 tpy**

Paved Roads
Maximum Vehicular Speed: 5 mph
Average Distance of Haul: 0.15 miles

Vehicle Type	No. of One Way Trips per Hour	Weight
Tanker	0.29	37.5
Vans	0.25	35
Roll Off Boxes	0.08	35
Dump Truck	0.04	37.5
total	0.66	

Weighted Average Gross Weight: 36.25 tons
Calculations:
E = k(sL/2)^0.65 * (W/3)^1.5

E = Emission factor (lbs/vehicle miles traveled(VMT))
k = 0.016 particle size multiplier for PM-10
0.082 particle size multiplier for PM
sL 3 road surface silt content (g/m^2)
W 36.25 weighted average vehicle weight (tons) (calculate from table above)

source: AP-42, chapter 13.2.1, p. 13.2.1-6.
VMT= 867.24 (miles/yr)

PM
E = 4.48 lbs/VMT
Potential PM Emissions (ton/yr) = Emission factor (lbs/VMT) * VMT / 2000 (lbs/ton)
Potential PM Emissions (ton/yr) = **1.94** tpy

PM-10
E = 0.87 lbs/VMT
Potential PM-10 Emissions (ton/yr) = Emission factor (lbs/VMT) * VMT / 2000 (lbs/ton)
Potential PM-10 Emissions (ton/yr) = **0.38** tpy

Appendix A: Emission Calculations
Large Reciprocating Internal Combustion Engines - Diesel Fuel
Output Rating (>600 HP)
Maximum Input Rate (>4.2 MMBtu/hr)
Diesel-Fired Emergency Generator (G1)

Company Name: Tradebe Treatment and Recycling LLC
Source Address: 4343 Kennedy Avenue, East Chicago, IN 46312
Permit Number: T089-35879-00345
Reviewer: Dominic Williams

Output Horsepower Rating (hp)	896.0	Diesel-Fired Emergency Generator (G1)
Maximum Hours Operated per Year	500	
Potential Throughput (hp-hr/yr)	448,000	
Sulfur Content (S) of Fuel (% by weight)	0.500	

	Pollutant						
	PM*	PM10*	direct PM2.5*	SO2	NOx	VOC	CO
Emission Factor in lb/hp-hr	7.00E-04	4.01E-04	4.01E-04	4.05E-03 *(.00809S)*	2.40E-02 **see below	7.05E-04	5.50E-03
Potential Emission in tons/yr	0.16	0.09	0.09	0.91	5.38	0.16	1.23

*PM10 emission factor in lb/hp-hr was calculated using the emission factor in lb/MMBtu and a brake specific fuel consumption of 7,000 Btu / hp-hr (AP-42 Table 3.3-1).

**NOx emission factor: uncontrolled = 0.024 lb/hp-hr, controlled by ignition timing retard = 0.013 lb/hp-hr

Hazardous Air Pollutants (HAPs)

	Pollutant						
	Benzene	Toluene	Xylene	Formaldehyde	Acetaldehyde	Acrolein	Total PAH HAPs***
Emission Factor in lb/hp-hr****	5.43E-06	1.97E-06	1.35E-06	5.52E-07	1.76E-07	5.52E-08	1.48E-06
Potential Emission in tons/yr	1.22E-03	4.41E-04	3.03E-04	1.24E-04	3.95E-05	1.24E-05	3.32E-04

***PAH = Polyaromatic Hydrocarbon (PAHs are considered HAPs, since they are considered Polycyclic Organic Matter)

****Emission factors in lb/hp-hr were calculated using emission factors in lb/MMBtu and a brake specific fuel consumption of 7,000 Btu / hp-hr (AP-42 Table 3.3-1).

Methodology
Emission Factors are from AP 42 (Supplement B 10/96) Tables 3.4-1 , 3.4-2, 3.4-3, and 3.4-4.
Potential Throughput (hp-hr/yr) = [Output Horsepower Rating (hp)] * [Maximum Hours Operated per Year]
Potential Emission (tons/yr) = [Potential Throughput (hp-hr/yr)] * [Emission Factor (lb/hp-hr)] / [2,000 lb/ton]

Potential Emission of Total HAPs (tons/yr)	**2.47E-03**

Green House Gas Emissions (GHG)

	Pollutant		
	CO2	CH4	N2O
Emission Factor in lb/hp-hr	1.16E+00	6.35E-05	9.30E-06
Potential Emission in tons/yr	260	1.42E-02	2.08E-03

Summed Potential Emissions in tons/yr	**260**
CO2e Total in tons/yr	**261**

Methodology
Emission Factors are from AP 42 (Supplement B 10/96) Tables 3.4-1 , 3.4-2, 3.4-3, and 3.4-4.
CH4 and N2O Emission Factor from 40 CFR 98 Subpart C Table C-2.
Global Warming Potentials (GWP) from Table A-1 of 40 CFR Part 98 Subpart A.
Potential Throughput (hp-hr/yr) = [Output Horsepower Rating (hp)] * [Maximum Hours Operated per Year]
Potential Emission (tons/yr) = [Potential Throughput (hp-hr/yr)] * [Emission Factor (lb/hp-hr)] / [2,000 lb/ton]
CO2e (tons/yr) = CO2 Potential Emission ton/yr x CO2 GWP (1) + CH4 Potential Emission ton/yr x CH4 GWP (25) + N2O Potential Emission ton/yr x N2O GWP (298).

Appendix A: Emission Calculations
Reciprocating Internal Combustion Engines - Natural Gas
4-Stroke Lean-Burn (4SLB) Engines
Natural Gas-Fired Emergency Generator (G3)

Company Name: Tradebe Treatment and Recycling LLC
Source Address: 4343 Kennedy Avenue, East Chicago, IN 46312
Permit Number: T089-35879-00345
Reviewer: Dominic Williams

Maximum Heat Input Capacity (MMBtu/hr)	0.22	Natural Gas-Fired Emergency Generator (G3)
Maximum Hours Operated per Year (hr/yr)	500	
Potential Fuel Usage (MMBtu/yr)	112	
High Heat Value (MMBtu/MMscf)	1020	
Potential Fuel Usage (MMcf/yr)	0.11	

	Pollutant						
Criteria Pollutants	PM*	PM10*	PM2.5*	SO2	NOx	VOC	CO
Emission Factor (lb/MMBtu)	7.71E-05	9.99E-03	9.99E-03	5.88E-04	4.08E+00	1.18E-01	3.17E-01
Potential Emissions (tons/yr)	0.0000	0.00	0.00	0.000	0.23	0.01	0.02

*PM emission factor is for filterable PM-10. PM10 emission factor is filterable PM10 + condensable PM.
PM2.5 emission factor is filterable PM2.5 + condensable PM.

Hazardous Air Pollutants (HAPs)

Pollutant	Emission Factor (lb/MMBtu)	Potential Emissions (tons/yr)
Acetaldehyde	8.36E-03	0.000
Acrolein	5.14E-03	0.000
Benzene	4.40E-04	0.000
Biphenyl	2.12E-04	0.000
1,3-Butadiene	2.67E-04	0.000
Formaldehyde	5.28E-02	0.003
Methanol	2.50E-03	0.000
Hexane	1.10E-03	0.000
Toluene	4.08E-04	0.000
2,2,4-Trimethylpentane	2.50E-04	0.000
Xylene	1.84E-04	0.000
Total		**0.00**

HAP pollutants consist of the eleven highest HAPs included in AP-42 Table 3.2-2.

Methodology
Emission Factors are from AP-42 (Supplement F, July 2000), Table 3.2-2
Potential Fuel Usage (MMBtu/yr) = [Maximum Heat Input Capacity (MMBtu/hr)] * [Maximum Hours Operating per Year (hr/yr)]
Potential Emissions (tons/yr) = [Potential Fuel Usage (MMBtu/yr)] * [Emission Factor (lb/MMBtu)] / [2000 lb/ton]

	Greenhouse Gas (GHG)		
Greenhouse Gases (GHGs)	CO2	CH4	N2O
Emission Factor in lb/MMBtu*	110	1.25	
Emission Factor in lb/MMcf**			2.2
Potential Emission in tons/yr	6.16	0.07	0.00
Summed Potential Emissions in tons/yr		6.23	
CO2e Total in tons/yr		7.95	

Methodology
*The CO2 and CH4 emission factors are from Emission Factors are from AP-42 (Supplement F, July 2000), Table 3.2-2
**The N2O emission factor is from AP 42, Table 1.4-2. The N2O Emission Factor for uncontrolled is 2.2. The N2O Emission Factor for low Nox burner is 0.64.
Global Warming Potentials (GWP) from Table A-1 of 40 CFR Part 98 Subpart A.
For CO2 and CH4: Emission (tons/yr) = [Potential Fuel Usage (MMBtu/yr)] * [Emission Factor (lb/MMBtu)] / [2,000 lb/ton]
For N2O: Emission (tons/yr) = [Potential Fuel Usage (MMCF/yr)] * [Emission Factor (lb/MMCF)] / [2,000 lb/ton]
CO2e (tons/yr) = CO2 Potential Emission ton/yr x CO2 GWP (1) + CH4 Potential Emission ton/yr x CH4 GWP (25) + N2O Potential Emission ton/yr x N2O GWP (298).

Abbreviations
PM = Particulate Matter
PM10 = Particulate Matter (<10 um)
SO2 = Sulfur Dioxide
NOx = Nitrous Oxides
VOC - Volatile Organic Compounds
CO = Carbon Monoxide
CO2 = Cabon Dioxide
CH4 = Methane
N2O = Nitrous Oxide
CO2e = CO2 equivalent emissions